

What is claimed is:

1. An apparatus for redundantly encoding a predetermined region of an image, the apparatus comprising:

5 a slice modeling unit which determines the structures of slices to be used in encoding the image and regions to be redundantly encoded so that image data of a predetermined region of the image to be redundantly encoded is contained in a plurality of slices;

a slice allocation unit which allocates image data of each region of an image to the plurality of slices;

10 a picture header encoding unit which encodes information required to decode the plurality of encoded slices and generates picture information; and

a slice encoding unit which encodes the image in units of slices according to the picture header information.

15 2. The apparatus of claim 1, wherein the slice modeling unit forms the slices in units of a series of macroblocks.

20 3. The apparatus of claim 1, wherein the slice modeling unit divides the image into at least one rectangular region and the other region and determines the structures of the slices so that each of the regions is included in at least one independent slice.

25 4. The apparatus of claim 1, wherein the slice modeling unit forms the slices in units of a set of macroblocks at certain positions of the inputted image.

5. The apparatus of claim 1, wherein the slice modeling unit determines the structures of the slices in which the image data will be included to be identical structure.

30 6. The apparatus of claim 1, wherein the slice modeling unit determines a plurality of structures as the structures of the slices in which the image data will be included.

7. The apparatus of claim 1, wherein the slice modeling unit determines regions, predetermined by a user as an important region from the image, as regions to be redundantly encoded.

5 8. The apparatus of claim 1, wherein the slice modeling unit determines regions to be redundantly encoded by detecting regions where motions are actively performed, from the image.

9. The apparatus of claim 1, wherein the slice modeling unit determines
10 the amount of the region to be redundantly encoded according to an error rate and a transmission bandwidth which occur in a transmission environment, and an encoding efficiency of the slice encoding unit.

10. The apparatus of claim 1, wherein the slice modeling unit comprises:
15 a slice structure modeling portion which determines the structures of the plurality of slices to be used for image encoding; and
a redundant encoding modeling portion which determines the position and amount of regions to be redundantly encoded from the image using the plurality of slices.

20 11. The apparatus of claim 1, wherein the slice allocation unit determines the sizes of the plurality of slices according to the amount of the regions to be redundantly encoded.

25 12. The apparatus of claim 1, wherein the slice allocation unit allocates the image data to the plurality of slices so that each of the slices includes both regions to be redundantly encoded and regions to be not redundantly encoded.

30 13. The apparatus of claim 1, wherein the slice allocation unit allocates the image data to the plurality of slices so that at least one slice includes image data of only a region to be redundantly encoded.

14. The apparatus of claim 1, wherein the picture header encoding unit

encodes picture header information containing the structure, position, and size of each slice.

15. The apparatus of claim 1, wherein the slice encoding unit comprises:
5 a slice header encoding portion which generates a slice header containing information used to encode a macroblock in the slice;
a temporal/spatial predictive encoding portion which performs temporal/spatial predictive encoding in units of slices of the image;
a transform quantization portion which transforms the temporal/spatial
10 predictively-encoded data into a frequency region and quantizes the data; and
an entropy-encoding portion which entropy-encodes the quantized data.

16. The apparatus of claim 15, wherein the slice header includes flag
information which indicates whether the slice to be encoded includes only regions to
15 be redundantly encoded.

17. The apparatus of claim 1, wherein, when the plurality of slices in which
the image data of the regions to be redundantly encoded are contained are encoded,
the slice encoding unit makes the redundantly-encoded data on one slice be
20 included in the other slices.

18. The apparatus of claim 1, wherein the slice encoding unit quantizes
and encodes each of the slices in which the regions to be redundantly encoded are
included, at different quantization intervals.
25

19. The apparatus of claim 1, wherein the slice encoding unit encodes only
main information containing a macroblock header and a motion vector of the regions
to be redundantly encoded in one slice and encodes all information of the regions to
be redundantly encoded in the other slice among two slices including the image data
30 of the region to be redundantly encoded.

20. The apparatus of claim 1, wherein the slice encoding unit encodes only

main information containing a macroblock header, a motion vector, and a DC coefficient contained in a DCT coefficient of the regions to be redundantly encoded in one slice and encodes all information of the regions to be redundantly encoded in the other slice among two slices including the image data of the regions to be redundantly encoded.

21. An apparatus for redundant image decoding, the apparatus comprising:
a picture header decoding unit which decodes picture header information containing the structures, positions, and sizes of slices in a bitstream where image data are encoded;

a slice construction unit which determines the structures and positions of a plurality of slices to be decoded according to the picture header information;

a slice decoding unit which decodes an image in units of slices according to the picture header information; and

an image construction unit which disposes a decoded slice image according to the structure and position of the slice determined by the slice construction unit and restores and outputs the image;

wherein predetermined regions of at least two slices of the plurality of slices constructed by the slice construction unit are overlapped on each other.

22. The apparatus of claim 21, wherein the slice decoding unit comprises:
an entropy-decoding portion which entropy-decodes an inputted bitstream in units of slices according to the position and size information of the slices;

an inverse-transform quantization portion which performs inverse-quantization of entropy-decoded image data, performs inverse-transform of the inversely-quantized image data into a temporal region, and generates temporal/spatial predictively-encoded image data; and

an image restoration portion which restores an image by compensating the temporal/spatial predictively-encoded image data.

23. The apparatus of claim 21, wherein, when information which indicates that a corresponding slice is composed of only redundant regions is contained in a header of the slice, the slice decoding unit decodes the slice composed of only the

redundant regions only if errors occur in another decoded slices including the redundant regions.

24. The apparatus of claim 21, wherein, when errors occur in a
5 redundantly-encoded region during image decoding, the image construction unit constructs an image using another slices including the image data of the redundantly-encoded region.

25. The apparatus of claim 21, wherein, when errors do not occur in all of
10 redundantly-decoded portions, the image construction unit constructs an image using the portions decoded with the smallest quantization interval.

26. A method for redundantly encoding a predetermined region of an image, the method comprising:

15 (a) determining the structures of slices to be used in encoding the image and regions to be redundantly encoded so that image data of a predetermined region of the image to be redundantly encoded is contained in a plurality of slices;

(b) allocating image data of each region of an image to the plurality of slices;

(c) encoding information required to decode the plurality of encoded slices
20 and generating picture information; and

(d) encoding the image in units of slices according to the picture header information.

27. The method of claim 26, wherein in (a), the slices are composed in
25 units of a series of macroblocks.

28. The method of claim 26, wherein in (a), the image is divided into at least one rectangular region and the other region, and the structures of the slices are determined so that each of the regions is included in at least one independent slice.

30 29. The method of claim 26, wherein in (a), the slices are composed of a set of macroblocks at certain positions of the inputted image.

30. The method of claim 26, wherein in (a), the structures of the slices in which the image data will be included are determined to be the identical one.

31. The method of claim 26, wherein in (a), a plurality of structures are determined as the structures of the slices in which the image data will be included.

32. The method of claim 26, wherein in (a), regions, predetermined by a user as an important region from the image, are determined as regions to be redundantly encoded.

33. The method of claim 26, wherein in (a), regions to be redundantly encoded are determined by detecting regions where motions are actively performed, from the image.

34. The method of claim 26, wherein in (a), the amount of the region to be redundantly encoded is determined according to an error rate and a transmission bandwidth which occur in a transmission environment, and an encoding efficiency of an encoder for encoding the slice.

35. The method of claim 26, wherein (a) comprises:
determining the structures of the plurality of slices to be used for image encoding; and
determining the position and amount of regions to be redundantly encoded from the image using the plurality of slices.

36. The method of claim 26, wherein in (b), the sizes of the plurality of slices are determined according to the amount of the regions to be redundantly encoded.

37. The method of claim 26, wherein in (b), the image data are allocated to the slices so that each of the slices includes both the image data of regions to be redundantly encoded and the image data of regions to be not redundantly encoded.

38. The method of claim 26, wherein in (b), the image data are allocated to the slices so that at least one slice includes image data of only a region to be redundantly encoded.

5 39. The method of claim 26, wherein in (c), picture header information containing the structure, position, and size of each slice is encoded.

40. The method of claim 26, wherein (d) comprises:
generating a slice header containing information used to encode a
10 macroblock in the slice;
performing temporal/spatial predictive encoding in units of slices of the image;
transforming the temporal/spatial predictively-encoded data into a frequency region and quantizing the data; and
entropy-encoding the quantized data.

15 41. The method of claim 40, wherein the slice header includes flag information which indicates whether the slice to be encoded includes only regions to be redundantly encoded.

20 42. The method of claim 26, wherein in (d), when the plurality of slices in which the image data of the regions to be redundantly encoded are contained are encoded, data redundantly encoded on one slice is to be included in the other slices.

25 43. The method of claim 26, wherein in (d), each of the slices in which the regions to be redundantly encoded are included is quantized and encoded at different quantization intervals.

30 44. The method of claim 26, wherein in (d), among two slices including the image data of the regions to be redundantly encoded, only main information containing a macroblock header and a motion vector of the regions to be redundantly encoded is encoded in one slice, and all information of the regions to be redundantly encoded are encoded in the other slice.

45. The method of claim 26, wherein in (d), among two slices including the image data of the regions to be redundantly encoded, only main information containing a macroblock header, a motion vector, and a DC coefficient contained in a DCT coefficient of the regions to be redundantly encoded is encoded in one slice,
5 and all information of the regions to be redundantly encoded are encoded in the other slice.

46. A method for redundant image decoding, the method comprising:

(a) decoding picture header information including the structures, positions,
10 and sizes of slices in a bitstream where image data are encoded;

(b) determining the structures and positions of a plurality of slices to be decoded according to the picture header information;

(c) decoding an image in units of slices according to the picture header information; and

15 (d) disposing a decoded slice image according to the structure and position of the slice determined in (b) and restoring and outputting the image;

wherein predetermined regions of at least two slices of the plurality of slices constructed in (b) are overlapped on each other.

20 47. The method of claim 46, wherein (c) comprises:

entropy-decoding an inputted bitstream in units of slices according to the position and size information of the slices;

performing inverse-quantization of entropy-decoded image data, performing inverse-transform of the inversely-quantized image data into a temporal region, and

25 generating temporal/spatial predictively-encoded image data; and

restoring an image by compensating the temporal/spatial predictively-encoded image data.

48. The method of claim 46, wherein in (c), when information which

30 indicates that a corresponding slice is composed of only redundant regions is included in a header of the slice, the slice composed of only the redundant regions are decoded only if errors occur in another decoded slices including the redundant regions.

49. The method of claim 46, wherein in (d), when errors occur in a region during image decoding, an image is restored using another slices including the redundantly-encoded region.

5 50. The method of claim 46, wherein in (d), when errors do not occur in all of redundantly-decoded portions, an image is restored using the portions decoded with the smallest quantization interval.

10 51. A computer readable recording medium where the method for redundant image encoding of claim 26 is recorded as an executable program code.

52. A computer readable recording medium where the method for redundant image decoding of claim 46 is recorded as an executable program code.